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EXAMINER
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MCCLOUD, RENATA D

ART UNIT	PAPER NUMBER
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2837

DATE MAILED: 01/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/943,705

Applicant(s)

EL-SADI, ASHRAF

Examiner

Renata McCloud

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-18 and 20-101 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 30-37, 39-41, 44-49, 51-54, 59, 60, 62, 65 and 74-101 is/are allowed.
- 6) ☒ Claim(s) 1-18, 20-29, 38, 42, 43, 50, 55-58, 61, 63, 64, and 66-73 is/are rejected.
- 7) ☒ Claim(s) 39-41, 51-54, 59, 60, 62 and 65 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 6-18, 20-26, 28, 64, and 67-73 are rejected under 35 U.S.C. 102(b) as being anticipated by Hassan et al (U.S. 6,462,496).

**Claims 1 and 64:** Hassan et al teach a driver (Fig. 4) having a current control device for a voice coil motor, used in a disk drive (e.g. Fig. 2), comprising a sensor (Fig. 3: 330) to sense a coil current in a voice coil motor (e.g. Col. 3:40-50); a transconductance amplifier (e.g. Fig. 4:410) to detect a current by comparing a coil current and a command current (e.g. Col. 4: 11-35; Claim 1) and means (Fig. 4: 404, loop filter) to integrate the error current into a coil current (Col. 4: 45-35; Col. 5: 32-48).

**Claims 6 and 67:** the means to integrate (Fig. 4: 404) includes a capacitor (Fig. 4: 406,408).

**Claims 7 and 68:** the means to integrate (Fig. 4: 404) includes a resistor (Fig. 4: resistor above 408).

**Claims 8 and 69:** an amplifier (Fig. 4: 410 is an amplifier that is part of the driver) to supply a coil current, the amplifier coupled to the integration means (Fig. 4: 404)

**Claims 9 and 70:** the sensor includes a sense resistor (Fig. 3:330).

**Claims 10 and 71:** the command current is received at the driver (Fig. 1: 166) from a microcontroller (Fig. 1: 160)

**Claims 11 and 72:** the means to integrate (Fig. 4: 404) includes a capacitor (Fig. 4: 406, 408) is connected to the transconductance amplifier (Fig. 4: 410).

**Claim 12:** the transconductance amplifier (Fig. 4: 410) has a first input (Fig. 4: the '+' input) and a second input (Fig. 4: the '-' input) such that the coil current is coupled to the first input of the amplifier, the command current is coupled to the second input of the amplifier wherein the amplifier detects the difference between the coil current and the command current (Col. 3: 45-62).

**Claims 13 and 73:** the means to integrate (Fig. 4: 404) is coupled to a gain buffer (Fig. 4: 410, gain occurring from amplification).

**Claim 14:** A method comprising a sensor (Fig. 3: 330) to sense a coil current in a voice coil motor (e.g. Col. 3:40-50); a transconductance amplifier (e.g. Fig. 4:410) to detect a current by comparing a coil current and a command current (e.g. Col. 4: 11-35; Claim 1) and means (Fig. 4: 404, loop filter) to integrate the error current into a coil current (Col. 4: 45-35; Col. 5: 32-48).

**Claim 15:** an amplifier (Fig. 4: 410) to amplify the coil current.

**Claim 16:** the command current is received at the driver (Fig. 1: 166) from a microcontroller (Fig. 1: 160).

**Claim 17:** The motor has a magnetic field (Col. 3: 2-8).

**Claim 18:** sensing a voltage and determining the coil current from the voltage (Col. 3:40-52).

**Claim 20:** determining the error current with a transconductance amplifier (Col. 3:52-62).

**Claim 21:** comparing the coil current and the command current at the transconductance amplifier (Col. 3: 45-62).

**Claim 22:** compensating the error current by delaying the integrating step (Fig. 4:423 is a switch which if not closed, would cause a delay in the current from going to 404).

**Claim 23:** a current control device for a vcm driver, the vcm coupled to a microprocessor (Fig. 1: 160), driver comprising and amplifier (Fig. 4: 410) and means (Fig. 4: 404) to integrate an error current with a command current to generate a coil current (Col. 3:46-63), wherein the error current is detected by comparing the command current and the coil current sensed with a sensor (Fig. 3: 330) coupled between the amplifier (Fig. 4: 410) and the vcm (Fig. 3: motor).

**Claim 24:** a transconductance amplifier (Fig. 4: 410) to detect and calculate the error current by comparing the command current and the coil current (Col. 3: 46-63).

**Claim 25:** the error current correlates to a voltage (Col. 3: 46-63) across the sensor (Fig. 3: 330).

**Claim 26:** the sensor is a resistor (Fig. 3: 330).

**Claim 28:** the amplifier (Fig. 4: 410) is coupled to transistors (Fig. 3: 310, 312, 314, 320, 324, 322).

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3. Claims 38, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Hassan et al (U.s. 5, 821,717).

**Claim 38:** Hassan et al teach a method comprising supplying a coil current to a vcm (Col. 3: 10-15), amplifying the coil current (Col. 3:15-19), and shaping a command current according to the coil current (Col. 3:20-37).

**Claim 42:** supplying a coil current to a center tap coupling the voice coil to the driver (Col. 3: 39-67).

**Claim 43:** amplifying the coil current with a current sense amplifier (Col. 3: 10-19).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan et al applied to claim 1 above, and further in view of Mortazavi et al (U.S. Patent 5,838,515).

**Claim 2:** Hassan et al teach the limitations of claim 1. Referring to claim 2, they do not teach a force couple created by the current in the VCM. Mortazavi et al teach a force couple created by the current in the VCM (e.g. Column 10, Lines 20-26).

It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Hassan et al to have a force couple as taught by Hassan et al '717. The advantage of this would a reduction in time and heat generated in the motor during a seek mode.

6. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan et al as applied to claim 1 above, and further in view of Lian et al (U.S. Patent 5,731,935).

**Claim 4:** Hassan et al teach the limitations of claim 1. Referring to claim 4, they do not teach first and second coil motors. Lian et al teach first and second coil motors (e.g. Fig. 5:40, 40; Col. 4: 41-45).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the driver taught by Hassan et al to include two coil motors as taught by Lian et al. The advantage of this would be the ability to drive the motors longer or control each coil so as to divide the currents between the two coils.

**Claim 5:** Hassan et al and Lian et al teach the limitations of 4. Referring to claim 5, Lian et al teach the first and second coil motors are in series (Fig. 5: 40 and 40) such that current flows through both motors (Col. 4: 40-47).

7. Claims 3, 27, 29, and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan et al (U.S. 6,462,496) in view of Hassan et al (U.S. 5,821,717).

**Claims 3 and 66:** Hassan et al '496 teaches the limitations of claims 1 and 64.

Referring to claims 3 and 66, they do not teach a current sense amplifier coupled to a transconductance amplifier. Hassan et al '717 teaches a current sense amplifier (Fig. 2: 114) coupled to a transconductance amplifier (Fig. 2: 128).

It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Hassan et al '496, to coupled a current sense amplifier to a transconductance amplifier as taught by Hassan et al '717. The advantage of this would be the ability to produce a signal proportional to the actual current passing through the vcm due to the amplifier sensing and amplifying the voltage drop across the sense resistor.

**Claim 27:** Hassan et al '496 teach the limitations of claim 23. Referring to claim 27, they do not teach a current sense amplifier coupled between the sensor and a compensator. Hassan et al '717 teach a current sense amplifier (Fig. 2: 114) coupled between a sensor (Fig. 2: 310) and an error amplifier (Fig. 2: 112).

It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Hassan et al '496, to coupled a current sense amplifier to a transconductance amplifier as taught by Hassan et al '717. The advantage of this would be the ability to produce a signal proportional to the actual current passing through the vcm due to the amplifier sensing and amplifying the voltage drop across the sense resistor.

**Claim 29:** Hassan et al '496 teaches a driver having a current control device for a vcm comprising an amplifier (Fig. 4: 404) to drive the vcm (Fig. 3: motor) with a coil



current, the coil current flows from one terminal (Fig. 3: 332) of the vcm to another terminal (Fig. 3: 334), both terminals are coupled to the driver (Fig. 4: 402); a sensor (Fig. 3: 330) to sense the vcm coil current, the sensor coupled between the amplifier (Fig. 4: 410) and the vcm (Fig. 3: motor); a transconductance amplifier (Fig. 4: 410) calculates an error current by comparing the sense current with the command current (Col. 3: 45-63) and means (Fig. 4: 404) to integrate an error current into a command current to determine the coil current (Col. 3: 45-63). Hassan et al '496 does not teach a current sense amplifier coupled to the transconductance amplifier.

Hassan et al '717 teaches a current sense amplifier (Fig. 2: 114) to amplify a voltage across the sensor (Fig. 2: 310), wherein the voltage correlates to the coil current (Col. 3: 16-19); a transconductance amplifier (Fig. 2: 128) coupled to the current sense amplifier (Fig. 2: 114) to receive the voltage and a command current, the transconductance amplifier calculates an error current by comparing the sense current with the command current (Col. 5: 23-36).

It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the apparatus taught by Hassan et al '496, to couple a current sense amplifier to a transconductance amplifier as taught by Hassan et al '717. The advantage of this would be the ability to produce a signal proportional to the actual current passing through the vcm due to the amplifier sensing and amplifying the voltage drop across the sense resistor.

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8. Claims 50, 57, 58, 61, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mohlere (U.S. Patent 4,422,027) in view of Hassan et al (U.S. Patent 5,821,717).

**Claims 50 and 58:** Mohlere teaches a driver and a method for controlling a voice coil motor (e.g. Figure 2) having a first coil motor and a second coil motor (e.g. Figure 2, Items Unit 1, and Unit 2, Column 1, Lines 10-14 and Lines 60-62), comprising a sensor to sense a velocity voltage across a coil motor (e.g. Column 2, Lines 40-45). Mohlere does not teach an error amplifier to calculate a differential between a velocity voltage and a command voltage and a retract amplifier to compensate a command voltage with a differential. Hassan et al teach an error amplifier to calculate a differential between a velocity voltage and a command voltage (e.g. Column 3, Lines 20-37) and a retract amplifier to compensate a command voltage with a differential (e.g. Figure 2, Item 113, Column 5, Lines 37-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Mohlere to include the teaching of Hassan et al. The advantage of this would be the improvement in velocity control and the reduction of both noise and complicated circuitry.

**Claims 57 and 63:** Mohlere and Hassan et al teach the limitations of claims 50 and 58. Referring to claims 57 and 63, Hassan et al teach the retract amplifier being turned on and off (e.g. Column 5, Lines 37- 67).

**Claim 61:** Mohlere and Hassan et al teach the limitations of claim 58. Referring to claim 61, Hassan et al teach the retract amplifier coupled to the voice coil motor (e.g. Figure 2, Item 131 connected to 300).

**Claims 55 and 56:** Mohlere and Hassan et al teach the limitations of claim 50. Referring to claims 55 and 56, Hassan et al teach a coil motor comprising a coil winding (Fig. 2:300).

#### ***Allowable Subject Matter***

9. Claims 30-37, 44-49, and 74-101 are allowed. Claims 39-41, 51-54, 59, 60, 62, and 65 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

10. Applicant's arguments with respect to claims 1, 3-18 and 20-101 have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's argument that Mortazavi et al do not teach a force couple, there is nothing in applicant's claim language (Claim 3) that precludes the examiner from reading Mortazavi et al from teaching the latter. Referring to col. 10: 20-26, Mortazavi et al teach a reaction force that is created due to current flowing through the coil (24). Applicant is not claiming to what or between what a force couple is created. Applicant is only claiming that a force couple is created by the coil current.

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**Conclusion**


11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renata McCloud whose telephone number is (703) 308-1763 and is (571) 272-2069 after February 2, 2004. The examiner can normally be reached on Mon.- Fri. from 8 am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Nappi can be reached on (703) 308-3370. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Renata McCloud  
Examiner  
Art Unit 2837

RDM

  
RINA DUDA  
PRIMARY EXAMINER